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(54) **Stable anhydrous compositions for topical delivery of active materials.**

(57) An anhydrous, topically-effective composition that resists phase separation and exhibits improved sensory properties comprising a topically-active compound, such as an astringent salt; a finely-divided silica; a suspending wax composition; and a suitable volatile liquid carrier vehicle, such as a volatile silicone or a volatile hydrocarbon. The anhydrous, topically-effective composition is useful in topical cosmetic and medicinal preparations, such as antiperspirants, sunscreens and topical drug products, and is especially useful in cosmetic and medicinal preparations wherein an insoluble topically-active compound is dispersed throughout a liquid phase.

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STABLE ANHYDROUS COMPOSITIONS FOR TOPICAL DELIVERY OF ACTIVE MATERIALS

FIELD OF THE INVENTION

The present invention is directed to an anhydrous composition useful for the topical delivery of a topically-active component. More particularly, the anhydrous composition of the present invention is an unexpectedly stable suspension useful for the improved topical delivery of a topically-active compound, either cosmetic or medicinal, to the skin. Therefore, in general, the present invention is directed to an anhydrous, topically-effective composition comprising a topically-active compound, such as an antiperspirant compound, like a powdered astringent salt, a finely-divided silica; a suspending wax composition; and a suitable volatile liquid carrier vehicle. The topically-effective composition resists phase separation; is essentially nonwhitening and nonstaining to skin and clothing after topical application; effectively delivers the topically-active compound; and exhibits superior sensory properties.

BACKGROUND OF THE INVENTION

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As set forth in the Deckner U.S. Patent No. 4,563,346, an ideal composition for delivering a topically-active compound to skin or hair should be as stable as possible and should deliver the topically-active compound such that it adheres to the skin or hair while other non-active ingredients evaporate or are otherwise removed from the area of application. Topically-delivered active compounds, such as cosmetics, like an antiperspirant compound, and topical medications, like an antibacterial or an anti-inflammatory, traditionally have been prepared as either oil-in-water emulsions or water-in-oil emulsions. However, topically-effective compositions prepared as emulsions feel wet or oily when applied to the skin, and often remain sticky after the composition carrier vehicle evaporates. Furthermore, emulsion-type compositions require a relatively long time to dry after topical application. In addition, many emulsion-type compositions leave a white residue on contacted skin or clothing and actually stain clothing.

However, non-emulsified anhydrous compositions, like antiperspirants, are known in the art. Non-emulsified, oil-based topically-effective compositions are available, however these products often require shaking prior to each use in order to redisperse the insoluble topically-active compound that has separated from the composition. For example, U.S. Patent No. 3,873,686 discloses an anhydrous, liquid or creme antiperspirant composition comprising an alcohol-soluble aluminum chlorhydroxide-polyol complex in an anhydrous ethanol vehicle. Similarly, U.S. Patent No. 4,137,306 discloses the above-described anhydrous antiperspirant composition in solid stick form. U.S. Patent Nos. 4,053,581; 4,085,564 and 4,073,880 disclose liquid anhydrous antiperspirant compositions useful as pump-spray or roll-on products, wherein the antiperspirant compounds are solubilized in a vehicle including ethanol and a sufficient amount of volatile and/or non-volatile silicone liquid to reduce tackiness of the antiperspirant. U.K. Patent Application No. 2018590A describes an anhydrous antiperspirant spray composition including from 60% to 90% of a volatile cyclic silicone in order to improve composition efficacy by increasing adherence of the antiperspirant composition to the skin and hair. Nevertheless, although suspending agents are included in each of the above-cited references, shaking of the antiperspirant compositions before use is necessary in order to redisperse the separated antiperspirant compound.

Stable, non-separating antiperspirant compositions also are known in the art. U.S. Patent No. 4,749,569 discloses an extrudable antiperspirant paste, or creme, composition stabilized against phase separation by thickening the antiperspirant composition with from 4.6% to 9.5% of a finely-divided silica and from 2% to 25% of a quaternized three-layer clay exfoliated with a polar solvent. If a finely-divided silica is used as the sole thickening, or suspending, agent an unstable product results, thereby requiring the use of an additional suspending agent, like an organoclay. However, the presence of an organoclay in an antiperspirant composition is a principal source of the whitening and staining of the skin and clothing.

Coopersmith U.S. Patent No. 3,818,105 discloses that C₁₂ to C₁₄ isoparaffinic hydrocarbons, when combined with naphthenic materials, are useful in a wide range of cosmetic formulations for lubrication of the skin to achieve a quick spreading, non greasy application with evaporation of the hydrocarbon after use without a greasy buildup. While the hydrocarbons disclosed in the Coopersmith patent lubricate the skin for better application of the cosmetic formula, the compositions of Coopersmith do not achieve the unexpected stability achieved in accordance with the present invention. Other compositions containing volatile hydrocarbons, such as those disclosed in Bolich U.S. Patent No. 4,472,375, require polymeric water-soluble

thickening agents, such as guar gum, to effectively stabilize the compositions. The stability of the anhydrous compositions of the present invention achieved with a finely-divided silica and a suspending wax composition is unexpectedly superior to the above-mentioned prior art compositions.

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SUMMARY OF THE PRESENT INVENTION

The present invention is directed to a stable, anhydrous composition comprising a topically-active
 10 compound; a finely-divided silica; a suspending wax composition; and a suitable volatile liquid carrier vehicle. The suspending wax composition comprises a natural or synthetic wax, like castor wax; a volatile silicone or volatile hydrocarbon; and an ester.

Suspending wax compositions have been used in the paint industry as a suspending agent for
 15 pigments. Unexpectedly, it has been found that including a suspending wax composition, comprising a natural or synthetic wax, like castor wax; a volatile silicone or a volatile hydrocarbon; and an ester, in an anhydrous, topically-effective composition of the present invention eliminates the need for including the traditional organoclay suspending agents. Surprisingly, it was further found that including the suspending wax composition in a topically-effective composition, such as an antiperspirant, allows lesser amounts of the traditional active antiperspirant ingredients to be included in the composition. Consequently, the texture and
 20 consistency, or feel, of the antiperspirant composition is dramatically improved by masking, reducing, or eliminating the undesirable sensory properties attributed to the traditional antiperspirant compounds, such as stickiness. Other undesirable sensory properties reduced or eliminated by the compositions of the present invention include grittiness caused by the finely-divided silica; oiliness and long-drying time caused by the use of traditional emollients and polyols; and whitening and staining of skin and clothing caused by
 25 the organoclay suspending agents.

In addition, it has been found that the addition of a cosolvent, such as a non-volatile silicone, a high molecular weight ester, a high molecular weight polyol or an oil-soluble surfactant, to an anhydrous topically-effective composition of the present invention, further reduces or eliminates phase separation by enhancing the intermolecular bond formation, and therefore the suspending ability, of the finely-divided
 30 silica. It also was found that shearing the finely-divided silica prior to adding the silica to the volatile liquid carrier vehicle of the present invention further enhanced intermolecular silica bond formation, thereby further contributing to reduced phase separation.

In one important embodiment of the present invention, the anhydrous, topically-effective composition of the present invention incorporates an astringent salt as the topically-active compound to form a stable and
 35 efficacious antiperspirant composition. In other embodiments of the present invention, the anhydrous, topically-effective composition incorporates topically effective drugs and medicaments; topical anesthetics; sunscreen agents; skin-soothing emollients and other topical cosmetic compounds; topical anti-inflammatories; and the like. The topically-active compound incorporated into the anhydrous compositions of the present invention can be soluble or insoluble in the volatile liquid carrier vehicle. However, the composition
 40 of the present invention is especially useful in the topical delivery of particulate, topically-effective compounds that are homogeneously dispersed throughout the stable, anhydrous composition.

Accordingly, it is an object of the present invention to provide an anhydrous, topically-effective composition including either a solubilized topically-active compound or an insoluble and suspended topically-effective compound dispersed in a suitable, volatile liquid carrier vehicle, such that the composition
 45 is stable and resists phase separation.

Another object of the present invention is to provide a stable, anhydrous, topically-effective composition including a topically-active compound, a finely-divided silica, a suspending wax composition and a suitable volatile liquid carrier vehicle.

Another object of the present invention is to provide an anhydrous, topically-effective composition that
 50 efficiently delivers a topically-effective cosmetic or medicinal compound upon application to skin or hair.

Another object of the present invention is to provide an anhydrous, topically-effective composition useful as an antiperspirant and including a volatile silicone or volatile hydrocarbon compound; an astringent salt; a finely-divided silica; and a suspending wax composition.

Still another object of the present invention is to provide an anhydrous antiperspirant composition
 55 having an unexpectedly frictionless application to the skin and including a volatile silicone or volatile hydrocarbon compound; an astringent salt; a finely-divided silica; and a suspending wax composition.

Another object of the present invention is to provide an anhydrous, topically-effective composition that is not tacky or sticky after topical application, and that dries relatively quickly after topical application.

Another object of the present invention is to provide an anhydrous, topically-effective composition that is useful as an antiperspirant and that is essentially nonwhitening and nonstaining to the skin and to clothing after topical application.

It is also a further object of the present invention to provide an anhydrous antiperspirant composition that exhibits unexpectedly smooth topical application to the skin; effectively delivers the topically-active compound; and has superior sensory properties.

Other objects of the present invention include providing an anhydrous, topically-effective composition for the administration of topically-active compounds, such as topically effective drugs and medicaments, topical anesthetics, sunscreen agents, skin-soothing emollients and other topical cosmetic compounds; topical anti-inflammatories and the like by incorporating the topically-active compound in an anhydrous composition comprising a finely-divided silica, a volatile silicone or a volatile hydrocarbon and a suspending wax composition.

The above and other objects and advantages of the present invention will become more apparent from the following detailed description of the preferred embodiments.

DETAILED DESCRIPTION OF THE INVENTION

The stable, anhydrous, topically-effective composition of the present invention generally includes a topically-active compound, such as an antiperspirant compound, like an astringent salt; a finely-divided silica; a suspending wax composition; and a suitable volatile liquid carrier vehicle. In accordance with an important feature of the present invention, the suspending wax composition comprises a natural or a synthetic wax, like castor wax; a volatile silicone or a volatile hydrocarbon; and an ester. More specifically, the stable, anhydrous, topically-effective composition of the present invention includes from about 0.01% to about 30% by weight of a topically-active compound, such as an astringent salt having antiperspirant properties; from about 0.1% to about 15% by weight of a finely-divided silica, as a thickening agent; from about 20% to about 95% by weight of a suitable volatile liquid carrier vehicle; and from about 1% to about 10% by weight of a suspending wax composition.

In addition, the suspending wax composition utilized in the present invention comprises from about 25% to about 35% by weight of a natural or synthetic wax, like castor wax; from about 30% to about 45% by weight of a volatile silicone or a volatile hydrocarbon; and from about 25% to about 40% by weight of an ester. The suspending wax composition is essential to the efficacy of the present invention and, as will be discussed more fully hereinafter, the components of the suspending wax composition must be preblended to form the suspending wax composition before admixing the suspending wax composition with the other essential ingredients of the composition the present invention. It has been found that adding the individual components of the suspending wax composition to prepare a composition of the present invention does not effectively reduce or eliminate phase separation of the composition.

In accordance with an important feature of the present invention, a wide variety of topically-active compounds can be incorporated into the stable, anhydrous compositions of the present invention. Such topically-active compositions include both cosmetic and medicinal compounds that act upon contact to the skin or hair. In accordance with another important feature of the present invention, the topically-active compound can be solubilized in the composition of the present invention or can be present as an insoluble, particulate material. In either case the anhydrous, topically-effective composition of the present invention is effective and is resistant to composition separation. In general, the topically-effective, anhydrous compositions of the present invention demonstrated essentially no phase separation if the topically-active compound is solubilized in the compositions. Furthermore, if the topically-active compound is insoluble in the composition, the anhydrous composition demonstrates essentially no phase separation if the insoluble topically-active compound has a particle size less than about 1000 μ (microns) and preferably less than about 500 μ . To achieve full advantages of the present invention, the topically-active compound has a particle size less than about 100 μ .

Therefore, the topically-active compound can be a cosmetically-active compound, a medically-active compound or any other compound that is useful upon application to the skin or hair. Such topically-active compounds include antiperspirants, antidandruff agents, antibacterial compounds, antifungal compounds, anti-inflammatory compounds, topical anesthetics, sunscreens and other cosmetic and medical topically-effective compounds.

Therefore, in accordance with an important feature of the present invention, the stable, anhydrous, topically-effective composition can include any of the generally-known antiperspirant compounds such as

finely-divided solid astringent salts like, but not limited to, aluminum chlorohydrate, aluminum chlorohydrox, zirconium chlorohydrate, and complexes of aluminum chlorohydrate with zirconyl chloride and/or hydroxylchloride, either in the presence or absence of an amino acid buffer such as glycine. In general, the amount of the topically-active compound, and in particular the amount of the antiperspirant compound, i.e., aluminum zirconium tetrachlorohydrox glycinate, in the composition can range from about 0.01% to about 30% by weight of the total composition, and to achieve the full advantage of the present invention, is present in the range of from about 5% to about 20% by weight.

In addition to antiperspirant compounds, other topically-active compounds can be included in the anhydrous compositions of the present invention in a sufficient amount to perform their intended function. For example, zinc oxide, titanium dioxide or similar compounds can be included if the composition is intended to be a sunscreen. Similarly, topically-active drugs, like antifungal compounds; antibacterial compounds; anti-inflammatory compounds; topical anesthetics; skin rash, skin disease and dermatitis medications; and anti-itch and irritation-reducing compounds can be included in the compositions of the present invention. For example, analgesics such as benzocaine, dyclonine hydrochloride, aloe vera and the like; anesthetics such as butamben picrate, lidocaine hydrochloride, xylocaine and the like; antibacterials and antiseptics, such as povidone-iodine, polymyxin b sulfate-bacitracin, zinc-neomycin sulfate-hydrocortisone, chloramphenicol, methylbenzethonium chloride, and erythromycin and the like; antiparasitics, such as lindane; deodorants, such as chlorophyllin copper complex, aluminum chloride, aluminum chloride hexahydrate, and methylbenzethonium chloride; essentially all dermatologicals, like acne preparations, such as benzoyl peroxide, erythromycinbenzoyl peroxide, clindamycin phosphate, 5,7-dichloro-8-hydroxyquinoline, and the like; anti-inflammatory agents, such as alclometasone dipropionate, betamethasone valerate, and the like; burn relief ointments, such as o-amino-p-toluenesulfonamide monoacetate and the like; depigmenting agents, such as monobenzone; dermatitis relief, such as the active steroid amcinonide, diflorasone diacetate, hydrocortisone, and the like; diaper rash relief, such as methylbenzethonium chloride and the like; emollients and moisturizers, such as mineral oil, PEG-4 dilaurate, lanolin oil, petrolatum, mineral wax and the like; fungicides, such as butocouazole nitrate, haloprogin, clotrimazole, and the like; herpes treatment drugs, such as 9-[(2-hydroxyethoxy) methyl] guanine; pruritic medications, such as alclometasone dipropionate, betamethasone valerate, isopropyl myristate MSD, and the like; psoriasis, seborrhea and scabicide agents, such as anthralin, methoxsalen, coal tar and the like; sunscreens, such as octyl p-(dimethylamino)-benzoate, octyl methoxycinnamate, oxybenzone and the like; steroids, such as 2-(acetyloxy)-9-fluoro-1',2',3',4'-tetrahydro-11-hydroxypregna-1,4-dieno[16,17-b]naphthalene-3,20-dione, and 21-chloro-9-fluoro-1',2',3',4'-tetrahydro-11b-hydroxypregna-1,4dieno [16z-17-b] naphthalene-3,20-dione. Any other medication capable of administration topically also can be incorporated into the anhydrous composition of the present invention in a sufficient amount to perform its intended function.

The topically-active compound of the composition is dispersed into a non-aqueous, volatile liquid carrier vehicle, such as a volatile silicone or a volatile hydrocarbon. It should be understood that although the composition of the present invention is preferably an anhydrous composition, it has been found that amounts of water up to about 20% by weight of the composition can be present without adversely affecting the composition. The water can be included intentionally or inadvertently as an ingredient in a component of the composition. However, to avoid a sticky feeling after application of the topically-effective composition to the skin, the amount of water should be present at less than 10% by weight, and to achieve the full advantage of the present invention, at less than about 5% by weight of the composition. After topical application of a composition of the present invention, the non-aqueous, volatile liquid carrier vehicle facilitates the rapid absorption of the topically-active compound into the skin, thereby eliminating the wet feeling of the carrier vehicle. The volatile liquid carrier vehicle then slowly evaporates, leaving the topically-active compound in contact with the skin.

Suitable non-aqueous volatile liquid carrier vehicles useful in the composition of present invention include the volatile, low molecular weight polydimethylsiloxane compounds. The volatile, low molecular weight polydimethylsiloxane compound can be either a linear or a cyclic polydimethylsiloxane compound, as long as the polydimethylsiloxane compound has sufficient volatility to volatilize from the skin after topical application of the composition onto the skin. Preferably the polydimethylsiloxane is a cyclic siloxane, like cyclomethicone. In general, the volatile silicones, such as cyclomethicone, feel very rich as they are applied to the skin, but then evaporate relatively quickly to leave only the non-volatile components on the skin.

Overall, volatile polydimethylsiloxane compounds useful in the compositions of the present invention include polydimethylsiloxane compounds having a viscosity in the range of from about 0.5 cs (centistokes) to about 10 cs. The preferred volatile polydimethylsiloxanes have a viscosity in the range of from about 2 cs to about 8 cs.

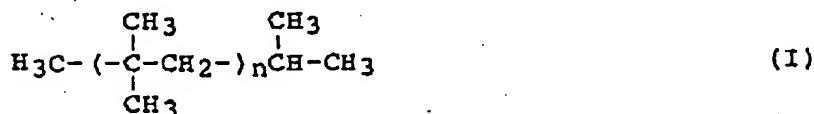
The cyclic, low molecular weight, volatile polydimethylsiloxanes, named in the CTFA Dictionary as

cyclomethicones, are the preferred siloxanes used in the composition of the present invention. To achieve the full advantage of the present invention, the cyclomethicones used in the compositions of the present invention are low viscosity, low molecular weight, water-insoluble cyclic compounds having an average of about 3 to about 6 - [O-Si(CH₃)₂]-repeating group units per molecule; boil at atmospheric pressure in a range of from about 150°C to about 250°C; and have viscosities at 25°C of from about 2 to about 8 centistokes. The polydimethyl cyclosiloxanes having an average of about 4 to about 5 repeating units per molecule, i.e., the tetramer and pentamer, are especially preferred. Suitable cyclomethicones are available commercially under the tradenames SILICONE 344 FLUID and SILICONE 345 FLUID from Dow Corning Corporation, Midland, MI, and SILICONE SF-1173 and SILICONE SF-1202 from General Electric, Waterford, NY, the tetramer being listed first in each instance.

An example of a linear, low molecular weight, volatile polydimethylsiloxane compound that is useful in the composition and method of the present invention is the compound named in the CTFA Dictionary as hexamethyldisiloxane, available commercially under the tradename DOW CORNING 200 FLUID, from Dow Corning Corp., Midland, MI. Hexamethyldisiloxane has a viscosity of 0.65 cs, is highly volatile, is non-greasy, provides lubrication for topical application of the composition of the present invention to the skin. Other linear polydimethylsiloxanes, such as decamethyltetrasiloxane, having a boiling point of about 195°C and a viscosity of 1.5 cs; octamethyltrisiloxane; and dodecamethylpentasiloxane, also have sufficient volatility to be useful in the composition of the present invention. In general, it has been found that linear, low molecular weight, volatile polydimethylsiloxane compounds having a viscosity at 25°C and 760 mm. Hg pressure in the range of from about 0.5 cs to about 5 cs, and a boiling point at atmospheric pressure ranging from about 100°C to about 250°C, are preferred for use in the composition and method of the present invention.

The volatile liquid carrier vehicle included in the composition of the present invention also can be a volatile hydrocarbon, such as a hydrocarbon including from about 10 carbon atoms to about 30 carbon atoms, that has sufficient volatility to slowly volatilize from the skin or hair after application of the topically-effective composition. The volatile hydrocarbons provide essentially the same benefits as the volatile silicone, such as lubrication and a rich feel during application.

The preferred volatile hydrocarbon compound is an aliphatic hydrocarbon including from about 12 to about 24 carbon atoms, and having a boiling point in the range of from about 100°C to about 300°C. Exemplary volatile hydrocarbons are depicted in general structural formula (I) wherein n ranges from 2 to 5,



Examples of volatile hydrocarbons useful in the anhydrous composition of the present invention are the commercially-available compounds PERMETHYL 99A and PERMETHYL 101A, corresponding to compounds of general structure (I) wherein n is 2 and 3, respectively, available from Permethyl Corporation, Frazer, PA. A volatile hydrocarbon compound is useful in the clear composition of the present invention either alone, in combination with another volatile hydrocarbon, or in combination with a volatile silicone.

The finely-divided silica used in the composition of the present invention acts as a suspending agent for the particulate topically-active compound in the volatile liquid carrier vehicle; aids in absorbing the volatile liquid carrier vehicle; and aids in reducing and preventing composition separation. The finely-divided silica is present in the compositions of the present invention in the range of from about 0.1% to about 3%, and preferably in the range of from about 0.5% to about 2%, by weight of the composition to provide a sufficient composition consistency suitable for use in a roll-on antiperspirant product. Amounts of finely-divided silica in excess of about 3%, and up to about 15%, by weight of the composition can be used to achieve a composition having a cream or paste consistency. Including amounts of finely-divided silica in excess of about 15% by weight provides a composition that has a gritty, and therefore, unpleasant and unacceptable consistency.

In accordance with an important feature of the present invention, the finely-divided silica should have a particle size in the range of from about 0.001 u (microns) to about 0.050 u, and preferably in the range from about 0.005 u to about 0.030 u. To achieve the full advantage of the present invention, the finely-divided silica has a particle size in the range of from about 0.010 u to about 0.020 u. A suitable finely-divided silica is fumed silica having a particle size ranging from about 0.14 u to about 0.16 u, and available from Cabot Corp., Tuscola, FL under the tradename CAB-O-SIL, or from DeGussa Corp., Teterboro, NJ under the

tradename AEROSIL COLLOIDAL SILICA.

The stable, anhydrous topically-effective compositions of the present invention also include from about 1% to about 10%, and preferably from about 1.5% to about 7%, by weight of the composition of a suspending wax composition. The suspending wax composition includes from about 25% to about 35% by weight of a natural or a synthetic wax; from about 30% to about 45% by weight of a volatile silicone or a volatile hydrocarbon; and from about 25% to about 45% by weight of an ester. In accordance with an important feature of the present invention, the suspending wax composition must be included in a topically-effective composition of the present invention, as opposed to individually adding the three separate components of the suspending wax composition to the topically-effective composition.

The suspending wax composition is prepared, for example, by dispersing about 30 parts by weight of a wax, like castor wax, in a mixture comprising about 16.5 parts by weight of an ester like dioctyl adipate and about 18.5 parts by weight cyclomethicone. The resulting dispersion was heated to about 190°F, and a mixture comprising about 16.5 parts by weight dioctyl adipate and about 18.5 parts by weight cyclomethicone is added to the heated, fused dispersion, under continuous high-shear stirring, as a thin stream. When the addition of the thin stream was completed, the resulting mixture was shock cooled to provide a paste-like suspending wax composition useful in the composition of the present invention.

The wax used in the suspending wax composition can be a natural or synthetic wax, such as, but not limited to, castor wax, beeswax, carnauba wax, ozokerite wax, candelilla wax, hydrogenated lanolin, cocoa butter and polyethylene. The particular identity of the wax is not critical as long as the wax provides a smooth and creamy sensory feeling and can be incorporated into the paste-like suspending wax composition, as described above.

The volatile silicone or volatile hydrocarbon that can be included in the suspending wax composition are the same volatile silicones and volatile hydrocarbons that are described above and that are independently included in the anhydrous, topically-effective composition of the present invention. For example, volatile silicones that can be included in the suspending wax composition include the low molecular weight polydimethylsiloxane compounds, such as the cyclic polydimethylsiloxane tetramer and the cyclic polydimethylsiloxane pentamer, available commercially under the tradenames SILICONE 344 FLUID and SILICONE 345 LIQUID, respectively, from Dow Corning Corp., Midland, MI., and SF-1173 and SF-1202, respectively, from General Electric, Waterford, NY. A suitable volatile hydrocarbon can be substituted for, or used in conjunction with, the volatile silicones. Volatile hydrocarbons having from about 12 to about 24 carbon atoms, and a boiling point in the range of from about 100°C to about 300°C, such as, for example, PERMETHYL 99A available from Permethyl Corp., Frazer, PA., are suitable for use in the suspending wax composition.

An ester also is included in the suspending wax composition. Although the identity of the specific ester, or combination of esters, is not especially critical, it has been found that suitable esters include at least 10 carbon atoms, and preferably the ester includes from about 12 to about 32 carbon atoms. For example, suitable esters include those comprising an alcohol or a polyol including from about eight to about twenty carbon atoms and a carboxylic acid including from two to about twelve carbon atoms, or conversely, an alcohol or polyol including from two to about twelve carbon atoms with a carboxylic acid including from about eight to about twenty carbon atoms. Examples of suitable esters include, but are not limited to, dioctyl adipate, C₁₂-C₁₅ alcohol benzoate, laureth-3 benzoate, neopentyl glycol dioctanoate, isodecyl neopentanoate, cetyl stearate, and isocetyl stearate. It should be understood that the straight chain esters (cetyl stearate) are preferred because they are faster drying than the corresponding branched esters (isocetyl stearate).

Unexpectedly, it was found that including a sufficient amount of the suspending wax composition in an anhydrous, topically-effective composition of the present invention provides a stable composition that resists phase separation, and that eliminates the need to include organoclay suspending agents. Consequently, the topically-effective composition is suitable as a cosmetic roll-on, cream or paste product that does not require shaking prior to use, that is essentially nonwhitening, nonstaining and non-oily after topical application, that dries quickly after topical application, and that exhibits improved efficacy and sensory properties.

Optionally, one or more cosolvents may be included in a topically-effective composition of the present invention to further aid in the reduction and elimination of phase separation, whitening, and staining; and to help provide favorable sensory properties to the composition. Suitable cosolvents include a nonvolatile silicone oil, a high molecular weight polyol, an oil-soluble surfactant, a high molecular weight ester and similar organic compounds. For example, the composition of the present invention may include a compatible skin-soothing cosolvent, such as a C₁₂-C₁₅ alcohol benzoate, a dimethylsilicone fluid or a phenylsilicone fluid, or the like. The cosolvent, or combination of cosolvents, can be present in the topically-effective

composition of the present invention in an amount ranging from about 5% to about 30%, and preferably from about 10% to about 30%, by weight of the composition.

The nonvolatile silicone oil cosolvent can be a nonvolatile dimethylpolysiloxane fluid or a nonvolatile diphenylpolysiloxane fluid. A preferred nonvolatile silicone is a dimethylpolysiloxane fluid listed in the CTFA Dictionary as a dimethicone and has a viscosity of at least about 10 centistokes.

The optional incorporation of a high molecular weight polyol or an oil-soluble surfactant into a topically-effective composition of the present invention also aids in the reduction or elimination of composition phase separation, the reduction of whitening and staining after composition application and the enhancement of the sensory properties of the composition. High molecular weight polyols or oil-soluble surfactants that can be included in a composition of the present invention include, but are not limited to, polysorbate 60, polypropylene glycol, decyl pyrrolidone, nonoxynol-2, and similar nonionic surfactants and polyols. Yet another optional cosolvent that can be included in a composition of the present invention is an ester having at least 10 carbon atoms, and preferably having between 10 and about 30 carbon atoms. Suitable esters include dioctyl adipate, laureth-3 benzoate, neopentyl glycol dioctanoate, isodecyl neopentanoate, and C_{12} - C_{15} alcohol benzoates.

Furthermore, minor amounts of emollients such as, fatty esters, fatty alcohols, mineral oil, polyether siloxane copolymers and the like, also can be included in a topically-effective composition of the present invention. Usually, such optional emollients are included in amounts ranging from about 0.1% to about 10% by weight of the topically-effective composition. Examples of optional emollients include, but are not limited to, isopropyl myristate, isopropyl palmitate, cetyl acetate, cetyl propionate, diisopropyl adipate, and PPG-15 stearyl ether.

In addition to the ingredients listed above, the anhydrous, topically-effective compositions of the present invention also may include other optional ingredients that are conventionally included in topical cosmetic and medicinal compositions of this character. For example, fragrances can be incorporated into the anhydrous, topically-effective composition in an amount within the range of from about 0.1% to about 10% based on the total weight of the composition. The composition of the present invention, when applied to skin, fixes a substantive fragrance film on the skin that resists water but that can be removed by washing. Other optional ingredients that can be included in the anhydrous composition of the present invention include, but are not limited to, drying agents, like talc or DRY FLO (aluminum starch octenylsuccinate); preservatives; and dyes. Generally, such optional ingredients are present in the compositions of the present invention in an amount of about 10% or less by weight. In addition, although the necessity of including an organoclay is virtually eliminated by the use of the suspending wax composition, an organoclay may be included in a composition of the present invention as an additional suspending agent in an amount of up to 20% by weight of the composition. An exemplary organoclay is a quaternized three-layer clay exfoliated with a polar solvent, like a quaternized montmorillonite clay exfoliated with propylene glycol.

The following specific examples are illustrative of the anhydrous, topically-effective compositions of the present invention. However, it should be understood that the present invention is not limited to the specific examples set forth below. By varying the proportions and the type of each of the essential ingredients within the indicated ranges, a composition of the present invention can be prepared in liquid, cream or paste form. In the following examples, all amounts of the various ingredients are expressed by weight percentages unless otherwise specifically stated. In each of the following examples, the suspending wax composition includes about 30% castor wax, about 37% cyclomethicone, and about 33% dioctyl adipate; and is a paste-like, gel material.

EXAMPLE 1	
Ingredient	% (by weight)
Fumed silica ¹⁾	1.5
Cyclomethicone ²⁾	73.5
Aluminum Zirconium Tetrachlorohydrate Glycolate ³⁾	22.0
Suspending Wax Composition	3.0

1) CAB-O-SIL, Cabot Corporation, Tuscola, IL

2) DOW CORNING 344 FLUID, Dow Corning Corp., Midland, MI.

3) Wickenol CPS 370, Wicken Products, Huguenot, NY

Procedure

The fumed silica was dispersed in the volatile liquid cyclomethicone, and the mixture was thoroughly blended until homogeneous. The aluminum chlorohydrate and the suspending wax composition then were added to the silica-silicone mixture, and the resulting mixture was charged through a colloid mill for at least two minutes until homogeneous. The resulting composition had physical properties suitable for use as a roll-on antiperspirant product. When topically-applied to the skin, the antiperspirant product was dry as opposed to oily or sticky; and the antiperspirant product exhibited excellent esthetic properties. The antiperspirant product showed negligible phase separation after a 4 month aging period at 27° C.

EXAMPLE 2	
Ingredient	% (by weight)
Fumed silica ¹⁾	1.5
Dimethicone ⁴⁾	20.0
Cyclomethicone ²⁾	53.5
Aluminum Zirconium Tetrachlorohydrate Glycinate ³⁾	22.0
Suspending Wax Composition	3.0

1) CAB-O-SIL, Cabot Corporation, Tuscola, IL

2) DOW CORNING 344 FLUID, Dow Corning Corp., Midland, MI.

3) Wickenol CPS 370, Wicken Products, Huguenot, NY

4) SF-9650, General Electric, Waterford, N.Y.

Procedure

The fumed silica was dispersed in the dimethicone and cyclomethicone, and the mixture was thoroughly blended until homogeneous. The aluminum chlorohydrate and suspending wax composition then were added to the silica-silicone mixture, and the resulting mixture was mixed at a high shear in a colloid mill until homogeneous. The resulting composition possessed physical properties suitable for use as a roll-on antiperspirant product. When topically applied to the skin, the antiperspirant product was dry, as opposed to oily or sticky, and the antiperspirant product exhibited excellent esthetic properties. The antiperspirant product showed negligible phase separation after a 5 month aging period at 27° C.

EXAMPLE 3	
Ingredient	% (by weight)
Fumed silica ¹⁾	1.5
C ₁₂ -C ₁₅ Alcohol Benzoate ⁵⁾	10.0
Cyclomethicone ²⁾	63.5
Aluminum Zirconium Tetrachlorohydrate Glycinate ³⁾	22.0
Suspending Wax Composition	3.0

1) CAB-O-SIL, Cabot Corporation, Tuscola, IL

2) DOW CORNING 344 FLUID, Dow Corning Corp., Midland, MI.

3) Wickenol CPS 370, Wicken Products, Huguenot, NY

5) FINSOLV TN, Finetex, Inc., Elmwood Park, NJ.

Procedure

The fumed silica was dispersed in the C₁₂-C₁₅ alcohol benzoate and the cyclomethicone, and the mixture was thoroughly blended until homogeneous. The aluminum chlorohydrate and the suspending wax composition then were added to the silica-silicone-benzoate mixture, and the resulting mixture was charged through a colloid mill for at least 2 minutes. The resulting composition possessed physical properties suitable for use as a roll-on antiperspirant product. When topically-applied to the skin, the resulting antiperspirant product was dry, as opposed to oily or sticky, and the antiperspirant product exhibited excellent esthetic properties. The antiperspirant product showed negligible phase separation after a 4 month aging period at 27° C.

EXAMPLE 4	
Ingredient	% (by weight)
Fumed silica ¹⁾	1.50
Polysorbate 80 ⁶⁾	0.24
C ₁₂ -C ₁₅ Alcohol Benzoate ⁵⁾	10.00
Cyclomethicone ²⁾	63.26
Aluminum Zirconium Tetrachlorohydrate Glycinate ³⁾	22.0
Suspending Wax Composition	3.00

1) CAB-O-SIL, Cabot Corporation, Tuscola, IL

2) DOW CORNING 344 FLUID, Dow Corning Corp., Midland, MI.

3) Wickenol CPS 370, Wicken Products, Huguenot, NY

5) FINSOLV TN, Finetex, Inc., Elmwood Park, NJ.

6) TWEEN 60, ICI Americas, Wilmington DE.

Procedure

The fumed silica was dispersed in a blend of polysorbate 80, the C₁₂-C₁₅ alcohol benzoate and the cyclomethicone, then the mixture was thoroughly blended until homogeneous. The aluminum chlorohydrate and the suspending wax composition was added to the homogeneous mixture, and the resulting mixture was charged through a colloid mill for at least 2 minutes until homogeneous. The resulting composition possessed physical properties suitable for use as a roll-on antiperspirant product. When topically-applied to the skin, the antiperspirant product was dry, as opposed to oily or sticky, and the antiperspirant product exhibited excellent esthetic properties. The antiperspirant product showed essentially no phase separation after a 4 month aging period at 27° C.

EXAMPLE 5	
Ingredient	% (by weight)
Fumed silica ¹⁾	1.50
Dimethicone ⁴⁾	15.00
C ₁₂ -C ₁₅ Alcohol Benzoate ⁵⁾	5.00
Cyclomethicone ²⁾	53.73
Polysorbate 60 ⁶⁾	0.12
Aluminum Zirconium Tetrachlorohydrate Glycinate ³⁾	22.0
Suspending Wax Composition	2.65

1) CAB-O-SIL, Cabot Corporation, Tuscola, IL

2) DOW CORNING 344 FLUID, Dow Corning Corp., Midland, MI.

3) Wickenol CPS 370, Wicken Products, Huguenot, NY

4) SF-9650, General Electric, Waterford, N.Y.

5) FINSOLV TN, Finetex, Inc., Elmwood Park, NJ.

6) TWEEN 60, ICI Americas, Wilmington DE.

Procedure

The fumed silica, dimethicone, and C₁₂-C₁₅ alcohol benzoate were thoroughly admixed until the fumed silica was uniformly dispersed. The cyclomethicone and the polysorbate 60 were added to the mixture, and the resulting mixture then was transferred to a colloid mill and mixed for 2 minutes until the mixture was homogeneous. The zirconium chlorohydrate then was added, and the composition was mixed until the zirconium chlorohydrate was completely dispersed. The suspending wax composition then was added to the mixture, and the resulting mixture was mixed until homogeneous. The homogeneous mixture then was returned to the colloid mill and mixed for at least 3 minutes. The resulting composition possessed physical properties suitable for use as a roll-on antiperspirant product. When topically-applied to the skin, the antiperspirant product was dry, as opposed to oily or sticky, and the antiperspirant product exhibited excellent esthetic properties. The antiperspirant product showed no phase separation after a 6 month aging period at 27° C.

EXAMPLE 6	
Ingredient	% (by weight)
Cyclomethicone ²⁾	47.55
Aluminum Zirconium Tetrachlorohydrate Glycinate ³⁾	22.00
Fumed Silica ¹⁾	1.50
Suspending Wax Composition	2.65
Dimethicone ⁴⁾	20.00
Hydrophobic Starch Derivative ⁷⁾	1.00
Diethyl Adipate ⁸⁾	3.50
Fragrance	0.30
Starch/Dextrin Fragrance	1.50

1) CAB-O-SIL, Cabot Corporation, Tuscola, IL

2) DOW CORNING 344 FLUID, Dow Corning Corp., Midland, MI.

3) Wickendol CPS 370, Wicken Products, Huguenot, NY

4) SF-9850, General Electric, Waterford, N.Y.

7) DRY FLO, National Starch and Chemical Co., Bridgewater, NJ

8) WICKENOL 158, Wicken Products, Huguenot, NY (Aluminum starch octenylsuccinate)

Procedure

The fumed silica, dimethicone, and cyclomethicone were thoroughly admixed until the fumed silica was uniformly dispersed. The mixture then was transferred to a colloid mill and mixed for at least 2 minutes, or until the mixture was homogeneous. The zirconium chlorohydrate and the hydrophobic starch derivative then were added to the mixture, and the resulting mixture was blended until both additives were completely dispersed. The suspending wax composition then was added to the mixture, and the resulting mixture was mixed until homogeneous. A premix of the diethyl adipate and the fragrances then was added to the homogeneous mixture. The resulting mixture was returned to the colloid mill and mixed for at least 3 minutes. The final composition possessed physical properties suitable for use as a roll-on antiperspirant product. When topically-applied to the skin, the antiperspirant product was dry, as opposed to oily or sticky, and the antiperspirant product exhibited exceptional esthetic properties. The antiperspirant product showed negligible phase separation after a 6 month aging period at 27° C.

EXAMPLE 7	
Ingredient	% (by weight)
Cyclomethicone ²⁾	38.13
Aluminum Zirconium Tetrachlorohydrate Glycinate ³⁾	22.00
Fumed Silica ¹⁾	0.80
Suspending Wax Composition	2.65
Polysorbate 60 ⁶⁾	0.12
Dimethicone ⁴⁾	10.00
C ₁₂ -C ₁₅ Alcohol Benzoate ⁵⁾	10.00
Quaternium-18 Hectorite in cyclomethicone ⁹⁾	10.00
Hydrophobic Starch Derivative ⁷⁾	1.00
Diethyl Adipate ⁸⁾	3.50
Fragrance	0.30
Starch/Dextrin Fragrance	1.50

1) CAB-O-SIL, Cabot Corporation, Tuscola, IL

2) DOW CORNING 344 FLUID, Dow Corning Corp., Midland, MI.

3) Wickenol CPS 370, Wicken Products, Huguenot, NY

4) SF-9650, General Electric, Waterford, N.Y.

5) FINSOLV TN, Finetex, Inc., Elmwood Park, NJ.

6) TWEEN 60, ICI Americas, Wilmington DE.

7) DRY FLO, National Starch and Chemical Co., Bridgewater, NJ

8) WICKENOL 158, Wicken Products, Huguenot, NY (Aluminum starch octenylsuccinate)

9) BENTONE GEL VS/5 PC, NL Chemicals, Hightstown, NJ

Procedure

The fumed silica, dimethicone, cyclomethicone, polysorbate 60 and C₁₂-C₁₅ alcohol benzoate were thoroughly admixed until the fumed silica was uniformly dispersed. The mixture then was transferred to a colloid mill and mixed for at least 2 minutes, or until homogeneous. The zirconium chlorohydrate and the hydrophobic starch derivative then were added to the mixture, and the resulting mixture was mixed until the zirconium chlorohydrate was completely dispersed. The suspending wax composition and the BENTONE GEL then were added to the mixture, and the resulting mixture was mixed until homogeneous. A premix of the diethyl adipate and the fragrances then was added to the homogeneous mixture. The resulting mixture was returned to the colloid mill and mixed for at least 3 minutes. The composition then was mixed with a turbine propeller until the composition was uniform and homogeneous. The composition possessed physical properties suitable for use as a roll-on antiperspirant product. When topically-applied to the skin, the antiperspirant product was dry, as opposed to oily or sticky, and the antiperspirant product exhibited exceptional esthetic properties. However, because of the presence of an organoclay, i.e., the BENTONE GEL, this particular antiperspirant product demonstrated increased whitening and staining of the skin and clothes. The antiperspirant product showed negligible phase separation after a 6 month aging period at 27° C.

EXAMPLE 8	
Ingredient	% (by weight)
Fumed silica ¹⁾	3.2
Cyclomethicone ²⁾	72.8
Titanium Dioxide	20.0
Suspending Wax Composition	4.0

1) CAB-O-SIL, Cabot Corporation, Tuscola, IL

2) DOW CORNING 344 FLUID, Dow Corning Corp., Midland, MI.

Procedure

The fumed silica is dispersed in the volatile liquid cyclomethicone and the mixture is thoroughly blended until homogeneous. The titanium dioxide and the suspending wax composition then are added to the silica-silicone mixture, and the resulting mixture is charged through a colloid mill for at least two minutes until homogeneous. The resulting composition has physical properties suitable for use as a paste sunscreen product. When topically-applied to the skin, the sunscreen product is dry as opposed to oily or sticky; and the sunscreen product exhibits excellent esthetic qualities.

EXAMPLE 9	
Ingredient	% (by weight)
Fumed silica ¹⁾	5.0
Cyclomethicone ²⁾	90.9
Benzethonium Chloride	0.1
Suspending Wax Composition	4.0

1) CAB-O-SIL, Cabot Corporation, Tuscola, IL

2) DOW CORNING 344 FLUID, Dow Corning Corp., Midland, MI.

Procedure

The fumed silica is dispersed in the dimethicone and volatile liquid cyclomethicone, and the mixture is thoroughly blended until homogeneous. The benzethonium chloride and suspending wax composition then are added to the silica-silicone mixture, and the resulting mixture is mixed at a high shear in a colloid mill until homogeneous. The resulting composition possesses physical properties suitable for use as a paste antibacterial product. When topically applied to the skin, the antibacterial product is dry, as opposed to oily or sticky, and the antibacterial product exhibits excellent esthetic properties.

Alternate volatile silicones, and mixtures of volatile silicones, can be substituted for the particular volatile silicone carrier vehicle used in the preceding examples. Similarly, other finely-divided silica compounds, such as AEROSIL COLLOIDAL SILICA, available from Degussa Corp., Teterboro, NJ., can be substituted for CAB-O-SIL brand of fumed silica.

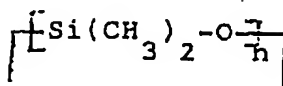
The anhydrous, topically-effective compositions of the present invention, comprising a topically-active compound, like an antiperspirant compound; a finely-divided silica; and suspending wax composition; and a suitable volatile liquid carrier vehicle, exhibit unique and superior properties upon topical applications to skin or hair. The improved physical and sensory properties include ultra-dry characteristics, both as to feel and

drying time; storage stability; elimination of the shaking requirement to redistribute the topically-active compound prior to use; substantially reduced whitening of the skin and clothing after topical application; and substantially reduced staining of clothing.

It should be understood that the foregoing detailed description is given merely by way of illustration. Obviously, many modifications and variations of the invention as hereinbefore set forth can be made without departing from the spirit and scope thereof and therefore only such limitations should be imposed as are indicated by the appended claims.

10 Claims

1. A topically-effective composition for application to the skin or hair comprising:
 - (a) from about 0.01% to about 30% by weight of a topically-active compound;
 - (b) from about 20% to about 99% by weight of a volatile liquid carrier vehicle;
 - (c) from about 0.1% to about 15% by weight of a finely-divided silica;
 - (d) from about 0.25% to about 3.5% of a wax; and
 - (e) from about 0.25% to about 4.0% by weight of an ester including at least ten carbon atoms.
2. The composition of claim 1 wherein the topically-active compound is an antiperspirant compound, an antidandruff compound, an antifungal compound, an anti-inflammatory compound, a sunscreen compound, an antibacterial compound, a topical anesthetic, a topical drug, a dermatological compound, or an analgesic compound.
3. The composition of claim 1 wherein the volatile liquid carrier vehicle is a cyclic volatile silicone, a linear volatile silicone, a volatile hydrocarbon or a combination thereof.
4. The composition of claim 1 wherein the wax is a synthetic wax, a natural wax or a combination thereof.
5. The composition of claim 1 wherein the ester includes from about 12 carbon atoms to about 32 carbon atoms.
6. A topically-effective composition for application to the skin or hair comprising:
 - (a) from about 0.01% to about 30% by weight of a topically-active compound;
 - (b) from about 20% to about 99% by weight of a volatile liquid carrier vehicle;
 - (c) from about 0.1% to about 15% by weight of a finely-divided silica; and
 - (d) from about 1% to about 10% of a suspending wax composition, wherein the suspending wax composition comprises from about 25% to about 35% by weight of a wax; from about 30% to about 45% by weight of a volatile silicone or a volatile hydrocarbon; and from about 25% to about 40% by weight of an ester including at least ten carbon atoms.
7. The composition of claim 6 wherein the topically-active compound is present in the range from about 1% to about 25 %, preferable from about 5% to about 20%.
8. The composition of claims 6 or 7 wherein the topically-active compound is an antiperspirant compound, an antidandruff compound, an antifungal compound, an anti-inflammatory compound, a sunscreen compound, an antibacterial compound, a topical anesthetic, a topical drug, a dermatological compound, or an analgesic compound.
9. The composition of claim 8 wherein the antiperspirant compound is an astringent salt selected from the group consisting of aluminum salts, zirconium salts, mixed aluminum zirconium salts and mixtures thereof.
10. The composition of claim 8, wherein the antiperspirant compound is selected from the group consisting of aluminum zirconium tetrachlorohydrate glycinate (a coordination complex of aluminum zirconium tetrachlorohydrate and glycine), aluminum chlorohydrate $\text{Al}_2(\text{OH})_5 \cdot n\text{H}_2\text{O}$, zirconium chlorohydrate (a soluble amorphous inorganic polymer formed by partial neutralization of zirconyl chloride) and aluminum chlorohydrate.
11. The composition of anyone of claims 6 to 10 wherein the volatile liquid carrier vehicle is present in the range from about 30% to about 75% by weight.
12. The composition of anyone of claims 6 to 11 wherein the volatile liquid carrier vehicle is a cyclic volatile silicone, a linear volatile silicone, a volatile hydrocarbon or a combination thereof.
13. The composition of claim 12 wherein the cyclic volatile silicone has a viscosity at 25 °C in the range of from about 2 centistokes to about 6 centistokes and a boiling point at 25 °C and 760 mm in the range of from 150 °C to about 250 °C.
14. The composition of claim 13 wherein the cyclic volatile silicone is a cyclomethicone (a cyclic dimethyl polysiloxane compound of the formula



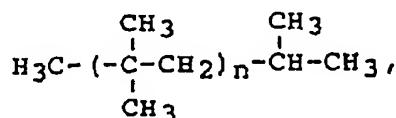
15. The composition of claim 14 wherein the cyclomethicone is selected from the group consisting of hexamethylcyclotrisiloxane, octamethylcyclotetrasiloxane, decamethylcyclopentasiloxane, dodecamethylcyclohexasiloxane, and mixtures thereof.

16. The composition of claim 12 wherein the linear volatile silicone has a viscosity at 25°C in the range of from about 0.5 centistokes to about 5 centistokes and a boiling point at 25°C and 760 mm in the range of from about 100°C to about 250°C.

17. The composition of claim 16 wherein the linear volatile silicone is selected from the group consisting of hexamethyldisiloxane, octamethyltrisiloxane, decamethyltetrasiloxane, dodecomethylpentasiloxane and combinations thereof.

18. The composition of claim 12 wherein the volatile hydrocarbon includes from about 12 carbon atoms to about 24 carbon atoms and has a boiling point at 25°C and 760 mm of from about 100°C to about 300°C.

19. The composition of claim 18 wherein the volatile hydrocarbon has the structural formula:



wherein n ranges from 2 to about 5, and mixtures.

20. The composition of anyone of claims 6 to 19 wherein the finely-divided silica is present in the range of from about 0.1% to about 5% preferably from about 0.5% to about 2% by weight of the composition.

21. The composition of anyone of claims 6 to 20 wherein the finely divided silica has a particle size ranging from about 0.001 µm to about 0.050 µm, preferably from about 0.010 µm to about 0.020 µm.

22. The composition of anyone of claims 6 to 21 wherein the finely-divided silica is fumed silica.

23. The composition of anyone of claims 6 to 22 wherein the suspending wax composition is present in the range from about 1.5% to about 7% by weight of the composition.

24. The composition of anyone of claims 6 to 23 wherein the ester of the suspending wax composition includes from about 12 carbon atoms to about 32 carbon atoms.

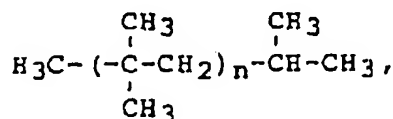
25. The composition of anyone of claims 6 to 24 wherein the ester of the suspending wax composition is dioctyl adipate.

26. The composition of anyone of claims 6 to 25 wherein the wax of the suspending wax suspension is a synthetic wax, a natural wax, a wax-like composition, or a combination thereof, and is preferably selected from the group consisting of castor wax, beeswax, carnauba wax, ozokerite wax, hydrogenated lanolin, hydrogenated cocoa butter, polyethylene, and mixtures thereof.

27. The composition of anyone of claims 6 to 26 wherein the volatile silicone of the suspending wax composition has a viscosity in the range of from about 0.5 centistokes to about 6 centistokes and a boiling point of 25°C and atmospheric pressure of from about 100°C to about 250°C.

28. The composition of anyone of claims 6 to 27 wherein the volatile hydrocarbon of the suspending wax composition is the same as the volatile hydrocarbon carrier vehicle as defined in claims 20 or 21.

29. The composition of anyone of claims 6 to 28 wherein the suspending wax composition comprises from about 25% to about 35% by weight castor wax; from about 30% to about 45% by weight of a volatile hydrocarbon having the structural formula:



wherein n ranges from 2 to about 5; and from about 25% to about 40% by weight of dioctyl adipate.

30. The composition of anyone of claims 6 to 29 further comprising from about 0.1% to about 30% by weight of a cosolvent.

31. The composition of claim 30 wherein the cosolvent is a nonvolatile silicone; a benzoate ester of an alcohol having from about 8 carbon atoms to about 30 carbon atoms; a high molecular weight polyol; an oil-soluble surfactant; or a combination thereof.

32. The composition of claim 31 wherein the nonvolatile silicone is a dimethicone, a diphenyl-siloxane fluid or a combination thereof, wherein the high-molecular weight polyol is preferably selected from the group consisting of polysorbate 80, polypropylene glycol and combinations thereof, and wherein the oil-soluble surfactant is preferably selected from the group consisting of decyl pyrrolidone, nonoxynol-2 and combinations thereof.

33. The composition of anyone of claims 8 to 31 further comprising about 0.1% to about 20% by weight of a quaternized three-layer clay exfoliated with a polar solvent, preferably a quaternized montmorillonite clay exfoliated with propylene glycol.

34. The composition of anyone of claims 6 to 33 further comprising optional ingredients selected from the group consisting of about 0.5% to about 2% by weight of a drying agent; from about 3% to about 10% by weight of an emollient; from about 0.5% to about 10% by weight of a fragrance; and combinations thereof, wherein the drying agent is preferably aluminum starch octenylsuccinate, and wherein the emollient is preferably selected from the group consisting of a fatty ester, a fatty alcohol, a mineral oil, a polyether siloxane copolymer and combinations thereof.

35. A method of delivering a topically-active compound comprising:

contacting the skin or hair with a sufficient amount of a composition as defined in anyone of claims 1 to 34.

36. A method of manufacturing a stable, topically-effective composition for the topical delivery of a topically-active compound comprising:

preparing a suspending wax composition comprising from about 25% to about 35% by weight of a wax; from about 30% to about 45% by weight of a volatile solvent selected from the group consisting of a volatile silicone, a volatile hydrocarbon, and combinations thereof; and from about 25% to about 40% by weight an ester including at least ten carbon atoms;

preparing a silicone dispersion comprising from about 0.1 parts to about 15 parts by weight of a finely-divided silica and from about 20 parts to about 95 parts by weight of a volatile liquid carrier vehicle; combining from about 1 part to about 10 parts by weight of the suspending wax composition with and from about 0.01 parts to about 30 parts by weight of a topically-active compound with the silica dispersion to form a topically-active mixture; and thoroughly admixing the topically-active mixture to form a homogeneous topically-effective composition.

Amended claims in accordance with Rule 86(2) EPC for the following Contracting States: ES, GR.

1. A process of producing a topically-effective composition for application to the skin or hair comprising mixing:

- (a) from about 0.01% to about 30% by weight of a topically-active compound;
- (b) from about 20% to about 99% by weight of a volatile liquid carrier vehicle;
- (c) from about 0.1% to about 15% by weight of a finely-divided silica;
- (d) from about 0.25% to about 3.5% of a wax; and
- (e) from about 0.25% to about 4.0% by weight of an ester including at least ten carbon atoms.

2. The process of claim 1 wherein the topically-active compound is an antiperspirant compound, an antidandruff compound, an antifungal compound, an anti-inflammatory compound, a sunscreen compound, an antibacterial compound, a topical anesthetic, a topical drug, a dermatological compound, or an analgesic compound.

3. The process of claim 1 wherein the volatile liquid carrier vehicle is a cyclic volatile silicone, a linear volatile silicone, a volatile hydrocarbon or a combination thereof.

4. The process of claim 1 wherein the wax is a synthetic wax, a natural wax or a combination thereof.

5. The process of claim 1 wherein the ester includes from about 12 carbon atoms to about 32 carbon atoms.

6. A process of producing a topically-effective composition for application to the skin or hair comprising mixing:

- (a) from about 0.01% to about 30% by weight of a topically-active compound;
- (b) from about 20% to about 99% by weight of a volatile liquid carrier vehicle;
- (c) from about 0.1% to about 15% by weight of a finely-divided silica; and
- (d) from about 1% to about 10% of a suspending wax composition, wherein the suspending wax composition comprises from about 25% to about 35% by weight of a wax; from about 30% to about 45% by weight of a volatile silicone or a volatile hydrocarbon; and from about 25% to about 40% by weight of an

ester including at least ten carbon atoms.

7. The process of claim 6 wherein the topically-active compound is present in the range from about 1% to about 25 %, preferable from about 5% to about 20%.

8. The process of claims 6 or 7 wherein the topically-active compound is an antiperspirant compound, an antidandruff compound, an antifungal compound, an anti-inflammatory compound, a sunscreen compound, an antibacterial compound, a topical anesthetic, a topical drug, a dermatological compound, or an analgesic compound.

9. The process of claim 8 wherein the antiperspirant compound is an astringent salt selected from the group consisting of aluminum salts, zirconium salts, mixed aluminum zirconium salts and mixtures thereof.

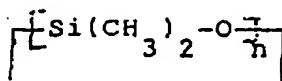
10. The process of claim 8, wherein the antiperspirant compound is selected from the group consisting of aluminum zirconium tetrachlorohydrate glycinate (a coordination complex of aluminum zirconium tetrachlorohydrate and glycine), aluminum chlorohydrate $\langle \text{Al}_2(\text{OH})_5 \rangle_n \times n\text{Cl}$, zirconium chlorohydrate (a soluble amorphous inorganic polymer formed by partial neutralization of zirconyl chloride) and aluminum chlorohydrate.

11. The process of anyone of claims 6 to 10 wherein the volatile liquid carrier vehicle is present in the range from about 30% to about 75% by weight.

12. The process of anyone of claims 6 to 11 wherein the volatile liquid carrier vehicle is a cyclic volatile silicone, a linear volatile silicone, a volatile hydrocarbon or a combination thereof.

13. The process of claim 12 wherein the cyclic volatile silicone has a viscosity at 25 °C in the range of from about 2 centistokes to about 8 centistokes and a boiling point at 25 °C and 760 mm in the range of from 150 °C to about 250 °C.

14. The process of claim 13 wherein the cyclic volatile silicone is a cyclomethicone (a cyclic dimethyl polysiloxane compound of the formula



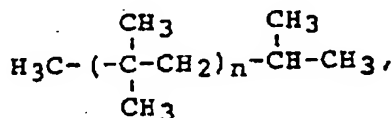
15. The process of claim 14 wherein the cyclomethicone is selected from the group consisting of hexamethylcyclotrisiloxane; octamethylcyclotetrasiloxane; decamethylcyclopentasiloxane; dodecamethylcyclohexasiloxane; and mixtures thereof.

16. The process of claim 12 wherein the linear volatile silicone has a viscosity at 25 °C in the range of from about 0.5 centistokes to about 5 centistokes and a boiling point at 25 °C and 760 mm in the range of from about 100 °C to about 250 °C.

17. The process of claim 16 wherein the linear volatile silicone is selected from the group consisting of hexamethyldisiloxane, octamethyltrisiloxane, decamethyltetrasiloxane, dodecomethylpentasiloxane and combinations thereof.

18. The process of claim 12 wherein the volatile hydrocarbon includes from about 12 carbon atoms to about 24 carbon atoms and has a boiling point at 25 °C and 760 mm of from about 100 °C to about 300 °C.

19. The process of claim 18 wherein the volatile hydrocarbon has the structural formula:



wherein n ranges from 2 to about 5, and mixtures.

20. The process of anyone of claims 6 to 19 wherein the finely-divided silica is present in the range of from about 0.1% to about 5% preferably from about 0.5% to about 2% by weight of the composition.

21. The process of anyone of claims 6 to 20 wherein the finely divided silica has a particle size ranging from about 0.001 μm to about 0.050 μm, preferably from about 0.010 μm to about 0.020 μm.

22. The process of anyone of claims 6 to 21 wherein the finely-divided silica is fumed silica.

23. The process of anyone of claims 6 to 22 wherein the suspending wax composition is present in the range from about 1.5% to about 7% by weight of the composition.

24. The process of anyone of claims 6 to 23 wherein the ester of the suspending wax composition includes from about 12 carbon atoms to about 32 carbon atoms.

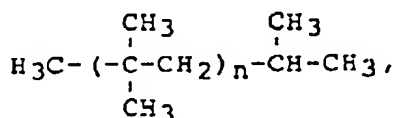
25. The process of anyone of claims 8 to 24 wherein the ester of the suspending wax composition is dioctyl adipate.

26. The process of anyone of claims 8 to 25 wherein the wax of the suspending wax suspension is a synthetic wax, a natural wax, a wax-like composition, or a combination thereof, and is preferably selected from the group consisting of castor wax, beeswax, carnauba wax, ozokerite wax, hydrogenated lanolin, hydrogenated cocoa butter, polyethylene, and mixtures thereof.

27. The process of anyone of claims 6 to 26 wherein the volatile silicone of the suspending wax composition has a viscosity in the range of from about 0.5 centistokes to about 6 centistokes and a boiling point of 25° C and atmospheric pressure of from about 100° C to about 250° C.

28. The process of anyone of claims 8 to 27 wherein the volatile hydrocarbon of the suspending wax composition is the same as the volatile hydrocarbon carrier vehicle as defined in claims 20 or 21.

29. The process of anyone of claims 6 to 28 wherein the suspending wax composition comprises from about 25% to about 35% by weight castor wax; from about 30% to about 45% by weight of a volatile hydrocarbon having the structural formula:



wherein n ranges from 2 to about 5; and from about 25% to about 40% by weight of dioctyl adipate.

30. The process of anyone of claims 8 to 29 further comprising from about 0.1% to about 30% by weight of a cosolvent.

31. The process of claim 30 wherein the cosolvent is a nonvolatile silicone; a benzoate ester of an alcohol having from about 8 carbon atoms to about 30 carbon atoms; a high molecular weight polyol; an oil-soluble surfactant; or a combination thereof.

32. The process of claim 31 wherein the nonvolatile silicone is a dimethicone, a diphenylsiloxane fluid or a combination thereof, wherein the high-molecular weight polyol is preferably selected from the group consisting of polysorbate 60, polypropylene glykol and combinations thereof, and wherein the oil-soluble surfactant is preferably selected from the group consisting of decyl pyrrolidone, nonoxynol-2 and combinations thereof.

33. The process of anyone of claims 6 to 31 further comprising admixing about 0.1% to about 20% by weight of a quaternized three-layer clay exfoliated with a polar solvent, preferably a quaternized montmorillonite clay exfoliated with propylene glykol.

34. The process of anyone of claims 6 to 33 further comprising admixing optional ingredients selected from the group consisting of about 0.5% to about 2% by weight of a drying agent; from about 3% to about 10% by weight of an emollient; from about 0.5% to about 10% by weight of a fragrance; and combinations thereof, wherein the drying agent is preferably aluminum starch octenylsuccinate, and wherein the emollient is preferably selected from the group consisting of a fatty ester, a fatty alcohol, a mineral oil, a polyether siloxane copolymer and combinations thereof.

35. A method of delivering a topically-active compound comprising: contacting the skin or hair with a sufficient amount of a composition obtainable by a process as defined in anyone of claims 1 to 34.

36. A method of manufacturing a stable, topically-effective composition for the topical delivery of a topically-active compound comprising:

preparing a suspending wax composition comprising from about 25% to about 35% by weight of a wax; from about 30% to about 45% by weight of a volatile solvent selected from the group consisting of a volatile silicone, a volatile hydrocarbon, and combinations thereof; and from about 25% to about 40% by weight an ester including at least ten carbon atoms;

preparing a silicone dispersion comprising from about 0.1 parts to about 15 parts by weight of a finely-divided silica and from about 20 parts to about 95 parts by weight of a volatile liquid carrier vehicle;

combining from about 1 part to about 10 parts by weight of the suspending wax composition with and from about 0.01 parts to about 30 parts by weight of a topically-active compound with the silica dispersion to form a topically-active mixture; and

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thoroughly admixing the topically-active mixture to form a homogeneous topically-effective composition.

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PARTIAL EUROPEAN SEARCH REPORT
which under Rule 45 of the European Patent Convention
shall be considered, for the purposes of subsequent
proceedings, as the European search report

Application number

EP 90110100.6

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US - A - 4 724 139 (V. PALINCZAR) * Column 2, line 51 - column 6, line 59 *	1-12, 18-20, 22-26	A 61 K 7/32 A 61 K 7/40 A 61 K 7/06
A	EP - A2 - 0 313 304 (THE PROCTER & GAMBLE) * Page 5, line 36 - page 10, line 11; page 13, line 49 - page 17, line 33 *	1-8, 11-14, 26, 34	
D, A	US - A - 3 818 105 (M. COOPERSMITH et al.) * Column 2, line 47 - column 3, line 18 *	1, 3-6, 18, 19, 24-26, 28, 29	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			A 61 K 7/00
INCOMPLETE SEARCH			
<p>The Search Division considers that the present European patent application does not comply with the provisions of the European Patent Convention to such an extent that it is not possible to carry out a meaningful search into the state of the art on the basis of some of the claims.</p> <p>Claims searched completely: 1-34, 36</p> <p>Claims searched incompletely: -</p> <p>Claims not searched: 35 (Article 52(4) EPC, method of the treatment of the human or animal body by therapy)</p> <p>Reason for the limitation of the search:</p>			
Place of search VIENNA		Date of completion of the search 10-08-1990	Examiner IRMLER
CATEGORY OF CITED DOCUMENTS			
<p>X : particularly relevant if taken alone</p> <p>Y : particularly relevant if combined with another document of the same category</p> <p>A : technological background</p> <p>O : non-written disclosure</p> <p>P : intermediate document</p> <p>T : theory or principle underlying the invention</p> <p>E : earlier patent document, but published on, or after the filing date</p> <p>D : document cited in the application</p> <p>L : document cited for other reasons</p> <p>& : member of the same patent family, corresponding document</p>			